RHODORA, Vol. 105, No. 923, pp. 296–302, 2003

NEBC MEETING NEWS

April 2003. Vice President Art Gilman introduced the evening's speaker, Dr. Jianhua Li from the Arnold Arboretum of Harvard University. Jianhua's talk was entitled "Botanic Expeditions in Guizhou, China—In Search of Natural Populations of Ginkgo." *Ginkgo biloba* is the only member of Ginkgoales, one of the five major lineages of seed plants (the others are Coniferales, Angiospermae, Gnetales, and Cycadales). It is considered by many to be found only in cultivation. The species is dioecious, and in China male plants produce pollen cones in April, while female plants produce ovules later in the season.

In the U.S., *Ginkgo biloba* is commonly used in herbal medicine, and the males are often planted as street trees (the seed-bearing females are considered unattractive as ornamentals). In China, where the species is widely distributed, it is the females that are planted most often, for their edible seeds are an important source of food. Jianhua remarked that the seeds, which need to be processed carefully before being eaten due to the presence of toxins, have the consistency of a "chewy peanut."

With Dr. Peter Del Tredici from the Arnold Arboretum, Jianhua traveled to southwestern China and met up with researchers from Zhejiang University and Guizhou University, including members of the Chinese Ginkgo Society. Together the team members visited several sites where *Ginkgo biloba* was known to grow, measured the diameter and height of the trees, and collected DNA samples for a genetic analysis that will help determine whether there is heterogeneity among Chinese ginkgo populations.

The team visited ancient *Ginkgo biloba* trees in the province of Zhejiang, from a thousand-year-old tree perched next to a temple on the summit of Mt. Wuyun, to a 30 m tall male tree in Fuyang County observed to have a few branches bearing female cones. In Fuquan, Guizhou, they visited a ginkgo tree marked by a sign claiming it was in the *Guinness Book of World Records*, a remarkable 35 m tall specimen with a diameter of 4.5 m. The tree had four main branches, most likely the result of sucker production. Jianhua reported that the tree had a hollow spot in the center that was so large that a farmer once lived there with his cow and pig.

The best candidates for natural *Ginkgo biloba* populations were groups of 20 or more trees observed in Wuchuan County, Guizhou, near valleys and mountain slopes where rice, corn, and other crops are cultivated. In these seemingly relic, natural plant communities, there

were many big ginkgo trees growing together with other Tertiary relics such as *Liquidambar formosana*, *Cupressus funebris*, and *Taxus chinensis*. These ginkgo populations had regenerative structures with seedlings and young individuals, and there were both males and females present. The sites where the ginkgo populations were found were mostly rocky slopes with little topsoil. To survive in these habitats, the trees anchored themselves with lignotubers that could grasp rocks and grow down into the soil layer.

The team also visited a "Ginkgo Village," located in Letuo, Panxian County. The sale of ginkgo seeds as a food source was a large part of the village's economy, and each tree there was individually owned. Though there were 1500 ginkgo trees in the village, there was only one male tree. To produce seeds on the females, pollen was collected from the male, mixed with water, and sprayed on the female trees. The ginkgo trees in Letuo village were large and quite tall, but had many low-growing branches, indicative of cultivated plants.

Jianhua concluded his talk by answering questions from club members about how to prepare ginkgo nuts for consumption and about the other uses of the plant in China, which include ginkgo-leaf tea and ornamental planting. He also spoke briefly about future projects, including his molecular analysis of ginkgo populations in China.

May 2003. The May meeting was held at the New England Wild Flower Society's Garden in the Woods in Framingham, Massachusetts. Karen Searcy introduced the evening's speaker, Dr. Peter Alpert from the University of Massachusetts—Amherst. Peter, who was inspired very early in his life to study plants, spoke about "Clonal Plants and Invasive Species: Combining Curiosity-driven and Problem-directed Research." Peter has done several investigative studies of clonal plant reproduction, using the aquatic herb *Eichhornia crassipes* (water hyacinth). *Eichhornia crassipes* is a South American species that was first introduced to North America in the late nineteenth century and is now invasive in many parts of the world. While known for its pale purple inflorescences, the species can also quickly and easily produce new clones via horizontal stems known as stolons. Peter noted that the advantages of clonal reproduction include the opportunity to control placement of offspring, the ability to share resources via nutrient transport, and the ability to signal attached clones to instigate plastic responses to environmental conditions. To test whether *E. crassipes* uses any of these mechanisms to succeed, Peter set up experiments exposing populations to combinations of sun and shade. When parent

plants were shaded but their clonal offspring were in the light, new stolons from the parent plant grew longer before touching the water and growing into new offspring. Speculating that awareness of the wavelengths of light and whether or not a plant is producing the shade could help *E. crassipes* avoid self-competition, Peter noted that plants in the center of a mat of clones tended not to produce stolons and to grow taller than their neighbors.

Peter also works with *Fragaria chiloensis* (beach strawberry), one of the wild progenitors of cultivated strawberries. *Fragaria chiloensis* also reproduces by stolons, producing a new plant at every other node. Using populations at Año Nuevo State Reserve in California, Peter demonstrated the transport of carbon and nitrogen between attached plants using radioactive and heavy isotopes of those key nutrients. Tests also showed that if a plant was not watered but remained attached to a watered plant, it grew as well as if it had been watered itself. To test what could be controlling the transfer of nutrients between clonal individuals of *F. chiloensis*, Peter looked closely at hormonal signals. Following the application of auxin, only the plants that started out with low concentrations of nitrogen or carbon increased the import of those nutrients. Also, data are currently being analyzed to see if there is a division of labor among attached plants within clones to make populations as a whole more efficient.

As a further investigation of the signals that occur between clonal plants, Peter looked at plant response to herbivore attack. The two-spotted spider mite (*Tetranychus urticae*) commonly infests commercial strawberry plants. The mites were first released on one *Fragaria chiloensis* plant, then later released on an attached clonal plant. While the initial clones showed much herbivore damage following the release of the mites, the clones that were attacked later were somehow "warned," making them better able to defend themselves against the mites, and to keep down the number of mites per plant. Finally, Peter demonstrated that attached *F. chiloensis* plants are better able to avoid competition from each other than separated clones. Two clonal plants were grown in the same pot, and were dyed either red or green to distinguish the two. Attached plants had clear root segregation between clones, while unattached clones did not. Another experiment that further prevented competition between root systems suggested that root segregation enables clones to reduce root competition and increase clonal performance.

—Jennifer Forman, Recording Secretary.

June 2003. The June "away" meeting was held at Split Rock Camp in Ashburnham, Massachusetts. The Friday evening speaker was Dr. Matthew G. Hickler of the University of Massachusetts—Amherst. Matt spoke on the topic "Vegetation Patterns and Species Diversity: Floodplain Ponds of the Nashua River."

The floodplain of the Nashua River at Fort Devens, Worcester County, Massachusetts has numerous ponds that were formed when meanders were cut off and became isolated. Matt, assisted by the "hippo-squad," studied fifteen of the floodplain ponds ranging in size from 0.25 to 2.5 hectares. This is a dynamic ecosystem. Spring floods can scour ponds or deposit sediment providing new habitat and altering old habitats. Although not dated, individual ponds last decades to a few hundred years. Hickler suspected that equilibrium models such as hydrarch succession would not be useful in understanding this ecosystem.

As a first step in understanding vegetation patterns and species diversity, the vegetation of each pond was sampled and species lists compiled. The ponds showed a marked zonation. Ponds typically had a central zone of open water characterized by *Spirodela polyrrhiza*, *Lemna minor*, *Wolffia brasiliensis*, and either *Ceratophyllum echinatum* or *C. demersum*, but not both. Additional common species included *Potamogeton natans* and *Nuphar variegata*. A deep marsh zone frequently followed the open water zone in the floodplain ponds. Common species in this zone included *Pontederia cordata* and *Sparganium americanum*. *Sparganium natans*, an endangered species in Massachusetts, was found on one pond in this zone. In 10 of the 15 ponds there was a zone of *Cephalanthus occidentalis* that formed a dense band along the shore. *Bidens discoidea*, a Massachusetts watchlist species, was observed as an epiphyte on the stems of this plant. Finally, 7 of the 15 ponds included a wet meadow. This zone was periodically flooded and was the most diverse, with a point diversity as high as 25–30 species/m^2. Species composition was highly variable but typically included an assortment of grasses and sedges mixed with a variety of herbaceous species including many annuals. *Scirpus cyperinus*, *S. tabernaemontani*, *Carex lacustris*, and *Typha latifolia* also contributed to diversity of this zone in some ponds.

Hickler found the floodplain ponds to be unexpectedly diverse relative to the surrounding area. Approximately 20% of the flora of former Fort Devens was found in the floodplain ponds even though they made up a fraction of 1% of the total fort area. One component of floodplain pond diversity was the difference in species composition between ponds, or beta-diversity. Of the 151 species recorded, 65 were

found in only one or two ponds while only 2 species were found in all ponds. Using Jaccard's coefficient of similarity, basically the percent of shared species, there was about a 34% similarity between any two ponds; thus the floras of the ponds tended to be unique. However, the diversity pattern was more complex since diversity was not evenly distributed among ponds. Twelve of the ponds were relatively species-poor with about 45 species per pond while 3 ponds were species-rich with about 90–100 species per pond. In addition, the three richest ponds had about 25% of species that occurred only once or twice, while species-poor ponds had about 10% of their species in this group.

Hickler concluded that, indeed, diversity patterns in the ponds did not fit equilibrium models of biodiversity. For example, the model of island biogeography predicts that large ponds should be species-rich, while smaller ponds should be species-poor. Instead, for the Fort Devens floodplain ponds there was no significant relationship between pond size and species number. Instead, a major factor in determining species richness appeared to be whether or not the pond was connected to the river. All species-rich ponds were connected to the Nashua River while none of the species-poor ponds were. The connected ponds followed the water level of the river. High water in the spring was followed by a rapid decline as the season progressed. The occasional heavy summer rain filled the connected ponds but these drained quickly and within a few days they regained their lower water, summer level. In contrast, for the ponds that were not connected, water levels dropped more slowly in the spring and perhaps more importantly, following heavy summer rain, low-diversity ponds remained flooded for some time.

Hickler concluded that the best way to understand the Fort Devens floodplain ponds was to view them as non-equilibrium systems. With sufficient disturbance, species could not establish competitive dominance so diversity was high irrespective of pond size. In addition, differences between richness levels could probably be attributed to the effect of summer floods, a disturbance that reduced diversity in isolated but not connected ponds.

—Karen B. Searcy, Recording Secretary, *pro tempore*.

June 6–8 Field Trips. Over 50 Club members and other naturalists joined together in Ashburnham, Massachusetts in order to survey the flora and fauna of several sites in the town. Assisting NEBC in hosting the event were members of the Ashburnham Conservation Trust, the Campaign for Watatic, and the Athol Bird and Nature Club. Camp Split

Rock in Ashburnham served as the headquarters for meetings, meals, field trips, and species identification. Camp chef for the weekend was Ernie Schori, who had served the Club so well in this capacity at the August 2002 Yale Camp outing in Connecticut.

On Friday afternoon, the group explored the Lincoln Pond area led by Paul Somers and Chris Gagnon, a local conservationist. Lincoln Pond is a pristine site with an extensive bog. While half the group hiked around the pond and bog, the other half explored the bog itself as well as the upland and spruce swamp on its western side. All were impressed by the numerous shrubs of *Rhododendron prinophyllum* and *Vaccinium myrtilloides* in the woods adjacent the bog, as well as the flowering *Calla palustris*, *Ledum groenlandicum*, *Kalmia polifolia*, *Chamaedaphne calyculata*, and *Rhododendron canadense* present in the bog. One uncommon sedge in Massachusetts, *Carex limosa*, was reported by those who visited the bog. While exploring an area of black spruce-dominated forest, a small contingent of botanists encountered clumps of tussock cottongrass, *Eriophorum vaginatum* subsp. *spissum*, a relatively uncommon species in the state. The best find of the day was not a plant, but *Williamsonia fletcheri*, an Ebony Boghaunter dragonfly. It was discovered by Michael Veit, and is the first record of this state endangered species from Ashburnham.

Saturday was dedicated to surveying Mt. Watatic. Local guides Dwight Horan, Diane Wright, Eugene Dionne, and Bob Leary, all from Ashby, and David Hilbrook, David Leary, and Dick Lampula, residents of Ashburnham, led hikes up the mountain. The groups made their approaches from different sides of the mountain so that the many different ecological communities could be observed. Although the day got rainier hour by hour, the naturalists returned to camp excited about their findings, which included a *Betula lenta* tree with a DBH of 113 cm. Some other botanical highlights: Don Lubin found the first record of *Dryopteris campyloptera* for Mt. Watatic, Art Gilman reported seeing *Lycopodium lagopus*, and Alice Schori spotted *Corallorhiza trifida* during a trek through a hemlock-dominated swamp on the western side of the mountain. In the evening, while some of the participants logged findings or gathered around scopes to examine their specimens, the musically inclined joined Lois Somers in performing folk tunes into the night.

Sunday morning, the naturalists set out with local guides Dan and Woody Johnson, Brian Mulroy, Bob Feen, and Howard LeVaux to survey portions of a 450-acre tract of land that the Ashburnham Conservation Trust and other conservation groups are working to conserve. Three outings occurred simultaneously to cover as much

ground as possible. Species lists for these surveys were compiled by Robert Bertin, Georgia Hall, Paul Somers, Lisa Standley, Art Gilman, Melanie Schori, Don Lubin, David Lovejoy, Sue Williams (bryophytes), Noah Siegel (fungi), and Jacob Morris-Siegel (birds). Discovery of *Botrychium matricariaefolium*, only known currently from a handful of sites in Massachusetts, was one of the highlights. Hemlock-dominated swamps in the lowlands were explored, yielding *Dalibarda repens*, and rock outcrops on uplands of Bush Hill provided habitat for species such as *Carex platyphylla*, *Oryzopsis asperifolia*, *Corydalis sempervirens*, *Schizachne purpurascens*, and *Poa saltuensis*. While only a small percentage of the tract was surveyed, it was evident that the native species diversity was relatively high and that the number of non-native species was extremely low due to the largely natural surrounding landscape. Art Gilman noted that the site appeared to be important moose-wintering habitat due to the heavy browsing of *Viburnum lantanoides*.

More complete accounts of some of the outings were recorded during the weekend. These journal accounts as well as the species lists compiled are posted on the NEBC website [www.huh.harvard.edu/nebc/].

—Paul and Lois Somers, Recording Secretaries, *pro tempore*.